

Course: Macroeconomics III

Professor: Michal Kejak

Instructions: Deadline for submitting homework is Monday, July 11, 2005 at 1330. Submit at the beginning of exercise session. Please remember that any attempt by a student to represent the work of another as his or her own and knowingly allowing another student to represent your work as his or her own is considered as academic dishonesty. This includes copying the homework of another student or another work without citing the appropriate source, and collaborating with someone else in an academic endeavor without acknowledging his or her contribution.

Homework 4

1. *Prob. 4.6 from Economic growth by Barro and Sala-i-Martin, 1st ed.:* **Adjustment costs with an Ak Technology** (based on Barro and Sala-i-Martin(1992)) Imagine that firms face an AK technology, but investment requires adjustment costs as described in section 3.5. The unit adjustment-cost function is $\phi(i/k) = (b/2) * (i/k)$, so that the total cost of purchasing and investment for 1 unit of capital is $1 + (b/2) * (i/k)$. Producers maximize the present value of cash flows,

$$\int_0^{\infty} \{A * K - I * [1 + (b/2) * (I/K)]\} * e^{-rt} dt,$$

where $r = A - \delta$. The maximization is subject to constraint $\dot{K} = I - \delta * K$

- (a) Set up the Hamiltonian and work out the first-order conditions for the representative firm. Find the relation between the interest rate and the growth rate of capital. Is this monotonic? Explain.
- (b) Assume that consumers solve the usual infinite-horizon Ramsey problem, so that the growth rate of consumption relates positively to the interest rate. Suppose that the growth rate of consumption equals the growth rate of the capital stock. Does this condition pin down the growth rate? If not, can one of the solutions be ruled out from the transversality condition?
- (c) Show that the growth rate of consumption equals the growth rate of the capital stock. What does this finding imply about the model's transitional dynamics? Explain.